HUMBER RIVER SEWERSHED

MONITORING PROGRAM

AN INVENTORY OF SAMPLING LOCATIONS,

METHODOLOGY AND DATA TYPES

AN INTERNAL REPORT OF THE TORONTO AREA

WATERSHED MANAGEMENT STRATEGY STUDY

PREPARED BY:

CASEY KENNEDY
WATER RESOURCES BRANCH
ONTARIO MINISTRY OF THE ENVIRONMENT

JUNE, 1987

BAGG

HUMBER RIVER SEWERSHED

MONITORING PROGRAM

AN INVENTORY OF SAMPLING LOCATIONS,

METHODOLOGY AND DATA TYPES

AN INTERNAL REPORT OF THE TORONTO AREA

WATERSHED MANAGEMENT STRATEGY STUDY

PREPARED BY:

CASEY KENNEDY
WATER RESOURCES BRANCH
ONTARIO MINISTRY OF THE ENVIRONMENT

JUNE, 1987

TABLE OF CONTENTS

TABLE OF CONTENTS		i
LIST OF TABLES		ii
LIST OF FIGURES		iii
ACKNOWLEDGEMENTS		iv
1.0	INTRODUCTION	1
2.0	TYPE OF DATA COLLECTED	5
2.1	Combined Sewer Sites	5
2.2	Storm Sewer Sites	5
3.0	EQUIPMENT USED FOR MONITORING	16
3.1	Combined Sewer Sites	16
3.1.1	Flow Monitoring Equipment	16
3.1.2	Sampling Equipment and Protocol	17
3.2	Storm Sewer Sites	17
3.2.1	Flow Monitoring Equipment	17
3.2.2	Sampling Equipment and Protocol	18
4.0	DATA PROCESSING AND MANAGEMENT	21
APPENDIX A		22
APPENDIX B		24
APPENDIX C		27

LIST OF TABLES

Table Number		Page
2.1.1.	Summary of CSO Data Collection April - October 1983	6
2.2.1	Summary of Storm Sewer Data Collection April 1983 - April 1984	7
2.2.2.A	Snowmelt Sheetflow Sampling Locations - Thistledown	8
2.2.2.B	Snowmelt Sheetflow Sampling Locations - Emery	11
A1	List of Monitored Events in the Hillary Catchment	23
B1	Storm Sewer Cold Weather Monitoring Season (April - December 1983)	25
B2	Storm Sewer Warm Weather Monitoring Season (January - April 1984)	26
C1	List of Parameters Analyzed	28

LIST OF FIGURES

Figure Number		Page
1	Map of Storm Sewer Catchments	2
2	Map of CSO Catchments	3
3	Reverse Suction Bicycle Pump	19
4	Industrial Vacuum Cleaner	20

ACKNOWLEDGEMENTS

The author wishes to thank F. Engler and R. McLean for their assistance in collecting data for this report, and W. Wong for direction and constructive criticism for improving the report.

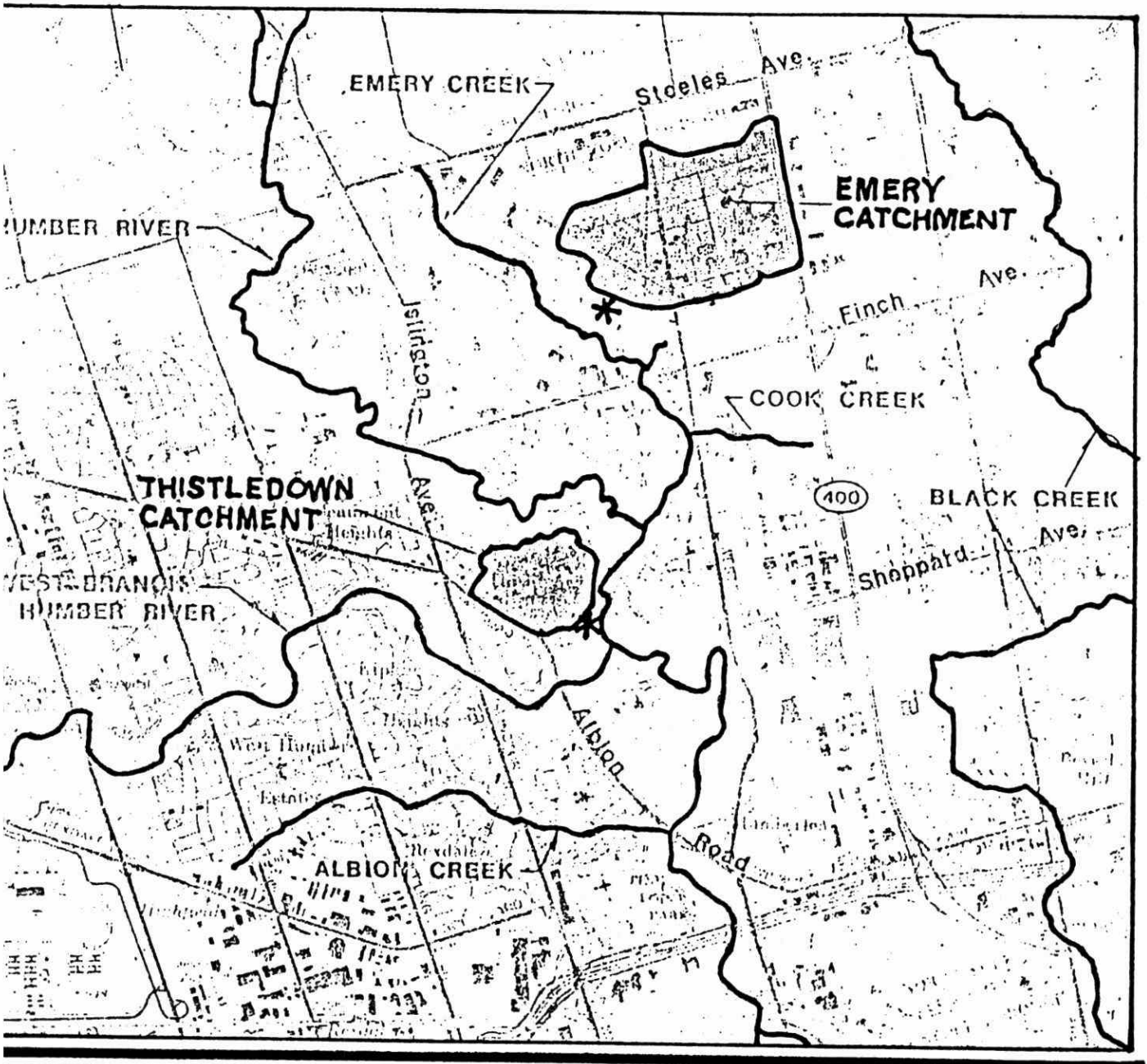
1.0 INTRODUCTION

The Humber River sewershed monitoring project was conducted as a part of the Toronto Area Watershed Management Strategy Study (TAWMS). Data was collected pertaining to the quality and quantity of the flow in urban sewer systems (both storm sewers and combined sewer overflows --- CSO) that discharged into the Humber River. Representative study catchments were selected based on data obtained from the Humber River Dry Weather Outfall Survey (1982-83) conducted by Gartner-Lee Associates for the Ministry of the Environment. Two storm sewer catchments and three CSO catchments were monitored for quality and quantity data (illustrated in Figure 1 and 2).

The data was used in other TAWMS projects. The stormwater data was used for determining the relative significance of pollution from different source areas and for developing a pollutant load forecasting model. The combined sewage data was used for establishing baseflow conditions during dry weather and for calibrating a simulation model. The results from this monitoring project can be found in the following reports: Toronto Area Watershed Management Strategy Study Humber River Pilot Watershed Project, Final Report (Robert Pitt and James McLean); and TAWMS Technical Report #7 Humber Sewershed Combined Sewer Overflow Study (Wan Wong).

The types of samples collected differed between the sewer systems. A wide range of samples were collected for the stormwater catchments: dry sediment samples, catchbasin samples, sheetflow samples, dry weather (baseflow) outfall samples, and wet weather outfall samples. For the CSO catchments only baseflow and wet weather samples were taken.

Figure 1: Storm Sewer Sites



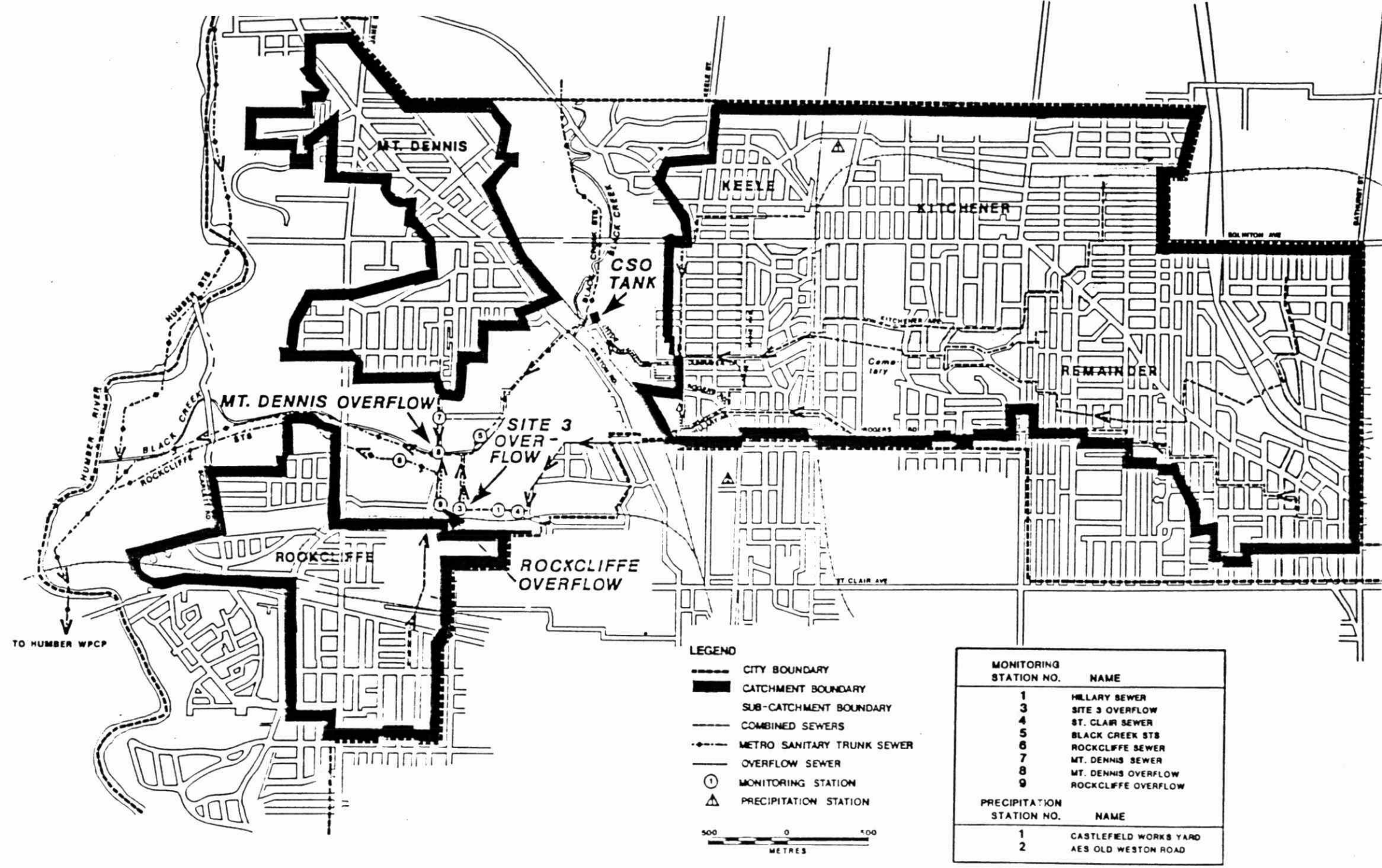


Figure 2: Combined Sewer Overflow Sites

The two storm sewer catchments were not activated at the same time, the Emery site was on-line in April 1983 whereas the Thistledown site was not operational until August 1983. Both of these sites were terminated in April 1984. The three CSO sites were monitored from April 1983 to October 1983.

2.0 Type of Data Collected

2.1 Combined Sewer Sites

A summary of the data collected is shown in Table 2.1.1. A full list of data can be found in Appendix A.

Flow data was recorded as depth of flow in the sewer. The data was recorded continuously at five minute intervals. The types of instruments used are noted in Table 2.1.1 and described in Section 3.0. Data formats are described in Section 4.0. Flow level data was subsequently converted to flow rate data. All of the data was originally stored and processed by the Hewlitt-Packard 125 micro-computer. The data was later converted to be used on the IBM PC (XT or AT) system.

Wet weather sewage samples were collected as instantaneous samples correlated with the time of collection; on occasion it was necessary to composite two or three samples (five minute intervals) in order to obtain enough sewage to submit for analysis. Dry weather sewage was collected as 24 hour composite sample (at equal time interval). Samples were analyzed for heavy metals, bacteria, phenols and general physical and chemical parameters (for a full listing of parameters see Appendix C).

2.2 Storm Sewer Sites

A summary of the data collected is shown in Table 2.2.1. A full list of data can be found in Appendix B.

Sewer discharge data was recorded as flow rate. The data at the Emery site was graphed continuously but was transcribed at five minute intervals. The data at the Thistledown site was recorded continuously at five minute intervals. Overland or sheet flow rates were not recorded. The type of equipment used for flow

TABLE 2.1.1 SUMMARY OF CSO DATA COLLECTION APRIL - OCTOBER 1983

LOCATION	DWF* QUAN.	DWF QUAL.	WWF** QUAN.	WWF QUAL.	INSTRUMENTATION EMPLOYED
Castlefield Works Yard					AES Tipping Bucket Rain Gauge AES Standard Rain Gauge
Hyde Ave. Tank Inlet			Yes		ISCO Data Aquisition System
Hyde Ave. Tank Overflow			Yes		
Site 3 Regulator			Yes		
Hillary Sewer (After Site 3)	Yes	Yes	Yes	Yes	
Mt. Dennis Sewer	Yes				
Rockcliffe Sewer	Yes				- Series 2300 Liquid Level Memory Module - Series 2100 Automatic Wastewater Samplers - Liquid Level Sensor
Mt. Dennis Regulator		Yes			
Rockcliffe Regulator		Yes			
St. Clair Ave. Sewer	Yes	Yes			Encon Surfer 8" Circular Chart Recorder (Site 5 Only)
Black Creek Sanitary Sewer	Yes	Yes			

* DWF = Dry Weather Flow

** WWF = Wet Weather Flow (14 Events were monitored)

SUMMARY OF STORM SEWER DATA COLLECTION APRIL 1983 - APRIL 1984

TABLE 2.2.1

TYPE OF DATA COLLECTED	EMERY	THISTLEDOWN	INSTRUMENTATION EMPLOYED
Precipitation	Yes	Yes	AES Tipping Bucket and Standard Rain Gauges (At the Emery Works Yard)
DWF * Quan.	Yes	Yes	ISCO Data Aquisition
Qual.	Yes	Yes	Instruments***
WWF** Quan.	Yes	Yes	ISCO Data Aquisition
Qual.	Yes	Yes	Instruments
Dry Weather Sediment Samples	Yes	Yes	Industrial Vacuum Cleaner, Paint Brush and Scraper
Wet Weather Sheetflow	Yes (45 locations in both catchments)	Yes	Reverse Suction Bicycle Pump
Snowmelt Sheetflow	Yes (25 locations in each catchment)	Yes	Reverse Suction Bicycle Pump
Pipeflow Quan.	Yes	Yes	ISCO Data Aquisition
Qual.	Yes	Yes	Instrument

*DWF = DRY WEATHER FLOW

**WWF = WET WEATHER FLOW

***Series 2100 Automatic Wastewater Sampler

Series 2300 Liquid Level Memory Modules

ISCO Level Sensors

Thistledown: ISCO 1710 printer for 2300 memory module

Emery: An Esterline Angus Miniservo Strip Chart Recorder was used to graph flow records that were converted by an AGM electronics area * volume multiplier

TABLE 2.2.2.A Snowmelt Sheetflow Sampling Locations

Catchment: Thistledown

Site #	Location	Source Type	Parameter Full	Parameter Part
T-1	Albion Mall - parking lot in front of Textile Town	paved parking		✓
T-2	Albion Mall - parking lot - 1 loading dock at back of A & P	loading dock	✓	
T-3	1-63A Thistledown Blvd. Townhouse Development	road		✓
				✓
T-4	Thistledown Church parking lot	paved parking		
T-5	Barkfield and Thistedown (S.W.)	road		✓
T-6	2,4 Humberland Ct.	gutter		✓
T-7	62 Barkfield	gutter	✓	
T-8	Alhart and Barkfield (S.E.)	sidewalk		✓
T-9	82 Alhart, 115 Alhart, 121 Alhart composite	gutter		✓
T-10	Calstock & Allcraft	gutter		✓

TABLE 2.2.2.A Snowmelt Sheetflow Sampling Location

Catchment: Thistledown

Site #	Location	Source Type	Parameteter Full	Part
T-11	Calstock & Buckhorn	grass swale		✓
T-12	A Calstock (near Buckhorn)	sidewalk		✓
T-13	Calstock & Buckhorn - School Playground	grass	✓	
T-14	7 Alhart, driveway	driveway		✓
T-15	3 Alhart, roadway	road		✓
T-16	125 Thistledown	sidewalk		✓
T-17	125 Thistledown - grass swale	grass swale	✓	
T-18	Thistledown Road in front of school	50/50 swale		✓
T-19	4-Alhart - driveway	driveway		✓
T-20	4,6 Alhart	grass swale		✓

TABLE 2.2.2.A Snowmelt Sheetflow Sampling Locations

Catchment: Thistledown

Site #	Location	Source Type	Parameteter Full	Part
T-21	46 Alhart (corner Alhart & Buckhorn)	grass		✓
T-22	14 Buckhorn	grass		✓
T-23	25 Barkfield	driveway		✓
T-24	17 Barkfield	driveway		✓

TABLE 2.2.2.B Snowmelt Sheetflow Sampling Locations

Catchment: Emery

Site #	Location	Source Type	Parameter Full	Parameter Part
E-1	North York Works Yard - grassed area near storm sewer outfall - westside	grass	✓	
E-2	North York Works Yard - eastside paved parking lot near catchbasin	paved parking		✓
E-3	North York Works Yard - eastside unpaved yard - near soil storage area	unpaved yard		✓
E-4	Waste Management Inc. Storage lot of Western Road	unpaved yard	✓	
E-5	Fenmar, North Side, about 100m from Intersection Weston Road (Burger Flame)	Butter		✓
E-6	Fenmar, (#84 approx.) industrial building at an angle to the road - unpaved lot	unpaved parking		✓
E-7	Corner of Kenmar (Kenmar)	sidewalk		✓
E-8	129 Fenmar (near Kenhar)	sidewalk		✓
E-9	3 Kenmar near Signet	driveway		✓

TABLE 2.2.2.B Snowmelt Sheetflow Sampling Locations

Catchment: Emery

Site #	Location	Source Type	Parameter Full	Parameter Part
E-10	5 Kenhar (Sunburst) - near the transformer	lawn	✓	
E-11	Approx. 7 Kenhar - Superior International near the Ultramar Gas Pump	unpaved parking		✓
E-12	Approx. 4 Kenhar	Gutter		✓
E-13	Signet - adjacent to Kenhar - Stormdrain out of Northern Telecom	Stormdrain	✓	
E-14	46 Norelco - Dayco Parking Lot - South Side	paved parking		✓
E-15	46 Norelco - Cayco Parking Lot - Front	paved parking		✓
E-16	30 Norelco - near Northern Telecom	gutter		✓
E-17	20 Norelco - south driveway near sidewalk	grass		✓
E-18	20 Norelco - centre of lawn	grass		✓

TABLE 2.2.2.B Snowmelt Sheetflow Sampling Locations

Catchment: Emery

Site #	Location	Source Type	Parameter Full	Parameter Part
E-19	North York Hydro - near transformers	unpaved lot	✓	
E-20	Lumberking Lumber Storage	unpaved storage	✓	
E-21	Toryork - Northside near Scotia Bond - 10 acre openfield	open field	✓	
E-22	164 Fenmar - Thomas Equipment	driveway		✓
E-23	21 Fenmar - Continental Area - rear parking lot	grassed area no parking		✓
E-24	Globe Meats, Rear Parking & Truck Dock	paved loading dock		✓
E-25	Signet (east side) North of Finch grassfield near Hydro substation	grass		✓

monitoring and sample collection are noted in Table 2.2.1 and are further described in Section 3.0. The flow rate data was manually transcribed into daily records and then passed on to Gartner-Lee Associates for further data manipulation. The data formats are detailed in Section 4.0.

There were two types of wet weather samples collected: outfall and sheetflow. The wet weather outfall samples were collected as flow-rated, composite samples for the duration of the event); on occasion grab samples were taken at the outfall to try to determine "first flush" quality and any uncharacteristic flow quality (visually different from the typical wet weather flow). The sheet flow samples were collected at various locations within each catchment during the summer-fall monitoring season 65 sheetflow samples collected in both catchments over several rain events. The samples were taken from the following source areas:

1) bare ground
2) unpaved driveways and storage areas
3) roof runoff
4) sidewalks
5) paved parking/storage areas and driveways
6) paved roads
7) grass swales
8) sealed roadside ditches
9) roadside guters
10) catchbasins
11) the separately drained Northern Telecom area in the Emery catchment. (Pitt and McLean)

The sample was taken from either water flowing over the ground grass, gravel or compacted compressed soil or water that collected in depressions (grass, gravel, compacted soil).

During the winter/spring monitoring season snowmelt samples were collected. Two types of samples were taken: outfall (in pipe), sheetflow. The outfall samples consisted of baseflow and snowmelt. Samples were designated as snowmelt based on two criterion: increased temperature and increased flow. Sheetflow samples were collected on two separate occasions (February 16-17 and March 21, 1984) at 25 sites within each catchment.
(See Tables 2.2.2.A and B).

Snow transect samples were collected in addition to outfall and sheetflow samples. The samples were collected to determine the water quality of the snowpack in both catchments. The monitoring site in the Thistledown catchment was located on Calstock Blvd. and on Signet Rd. in the Emery catchment. Samples representative of the complete vertical snow profile were collected at various distances from the road (1,5,10 and 25 metres) along a trench (perpendicular to the road). The snow samples were placed in a sterile plastic bog and then taken back to an unheated warehouse, and were slowly melted to an ice-water mixture. Once the snow had melted to the ice-water mixture it was transferred into the standard M.O.E. sample bottles and submitted for analysis.

There were two types of dry weather samples collected: baseflow and dry sediment. The baseflow samples were collected as 24 hour composite samples from the sewer. These samples were analyzed for the same parameters as the wet weather flow samples. The dry sediment samples were collected at various locations within each catchment and were analyzed for the following parameters: Chromium, Magnesium, Copper, Zinc, Lead, Total Phosphorus, Total Kjeldahl Nitrogen, Chemical Oxygen Demand (COD), Total Organic Carbon (TOC). The sediment samples were also analyzed for particle size distribution. Four classifications were used for distribution grouping:

1) 0 - 125 microns
2) 125 - 500
3) 500 - 2000
4) 2000 +

The samples were used to determine the physical and chemical characteristics of "potential" wash-off sediment. For further information on this aspect of the study refer to the Pitt-McLean report.

3.0 EQUIPMENT USED FOR MONITORING

3.1 Combined Sewer Sites

A brief outline of equipment used can be found in Table 2.1.1.

3.1.1. Flow Monitoring Equipment

The ISCO Series 2500 level aquisition system was employed in all but one of the monitoring stations (Site 5). The data Aquisition system at each site consisted of the use of a liquid level sensor and the model 2510 Liquid Level Memory Module. The data was stored in the memory module in 5 minute intervals. The data was extracted from the memory module by the model 2530 Field Interrogator. The information from the Interrogator (2530) was then transferred onto the Hewlitt-Packard 125 micro-computer. This process is further detailed in Section 4.0. Prior to site operation the model 2520 Calibrator was used to set the level sensor to read the proper levels. On routine site inspections the level reading was compared to the actual level in the pipe and on occasion it was necessary to re-calibrate the level sensor readings. At Site 5 an Encon Surfer 8" Circular Chart recorder was used to record flow levels instead of the 2510 Memory Module. The information from the chart recorder was extracted in five minute intervals and manually entered onto the computer.

3.1.2 Sampling Equipment & Protocol

The ISCO Series 2100 Automatic Wastewater Samplers were used to collect both dry and wet weather samples. The samplers were set up to collect up to 24 one litre samples. The samples collected by the automatic samplers were not used for bacteriological analysis. The samples for bacteria analysis were collected in the individual sample bottles attached to a specially designed pole. In some instances, flow in the sewer was too great for the use of the sampling pole so a galvinized stainless steel bucket was used to bring the sewage up to the surface (the bucket would be immersed in the sewage two to three times before a sample would be taken from it (the bucket would then be contaminated with the sample sewage prior to the sample being taken). The bacti bottle and then the purgeable bottle would be filled from the sewage in the bucket.

3.2 Storm Sewer Sites

A brief outline of equipment used can be found in Table 2.2.1.

3.2.1 Flow Monitoring Equipment

The ISCO Series 2300 flow module was used to receive the level readings from the liquid level sensor. Each 2300 module is equipped with a flow processor designed to convert flow level readings into flow rate based on individual pipe dimensions (using Mannings's N). At the Thistledown site the information was recorded on an ISCO 1710 printer. The information was recorded in five minute intervals. At the Emery site an Esterline Angus Miniservo Strip Chart Recorder was used to plot the readings from the AGM area X volume multiplier. The

AGM multiplier converted flow level readings from the 2300 module (no processor chip) into flow rate. The information from the strip chart was extracted in five minute intervals. The flow rate readings for both sites were not entered onto the computer but are available (for event days only) in chart form. The original records are also available.

3.2.2. Sampling Equipment & Protocol[1]

The ISCO 2100 Automatic Wastewater Samplers were used at both sites for outfall sample collection. At the Emery site the sewage was composited in a 45 gallon teflon coated steel drum. Sample bottles were filled (after the liquid drum had mixed) by pouring the sample through a funnel. Bacteria samples were taken from the composite sample (these samples were always taken first). The Thistledown site used a 5 gallon glass jar (washed and rinsed with distilled water) for compositing samples. The jar was brought back to the laboratory and sample bottles were filled using a glass funnel. Bacteria samples were taken from the composite sample.

During wet weather events sheet flow samples were collected using a reverse suction bicycle pump (see fig. 3). The sample would be pumped directly to the sample bottle and the capped. Dry weather sediment samples were collected using either an industrial vacuum cleaner (see fig. 4.) or a paint brush and scraper. The samples were taken from areas considered to be possible "washoff" contributors. When the vacuum cleaner was

---

[1] Sampling procedures did not always meet the accepted protocol due to field conditions. The data must be viewed keeping this factor in mind.

Figure 3
Reverse Suction Bicycle Pump

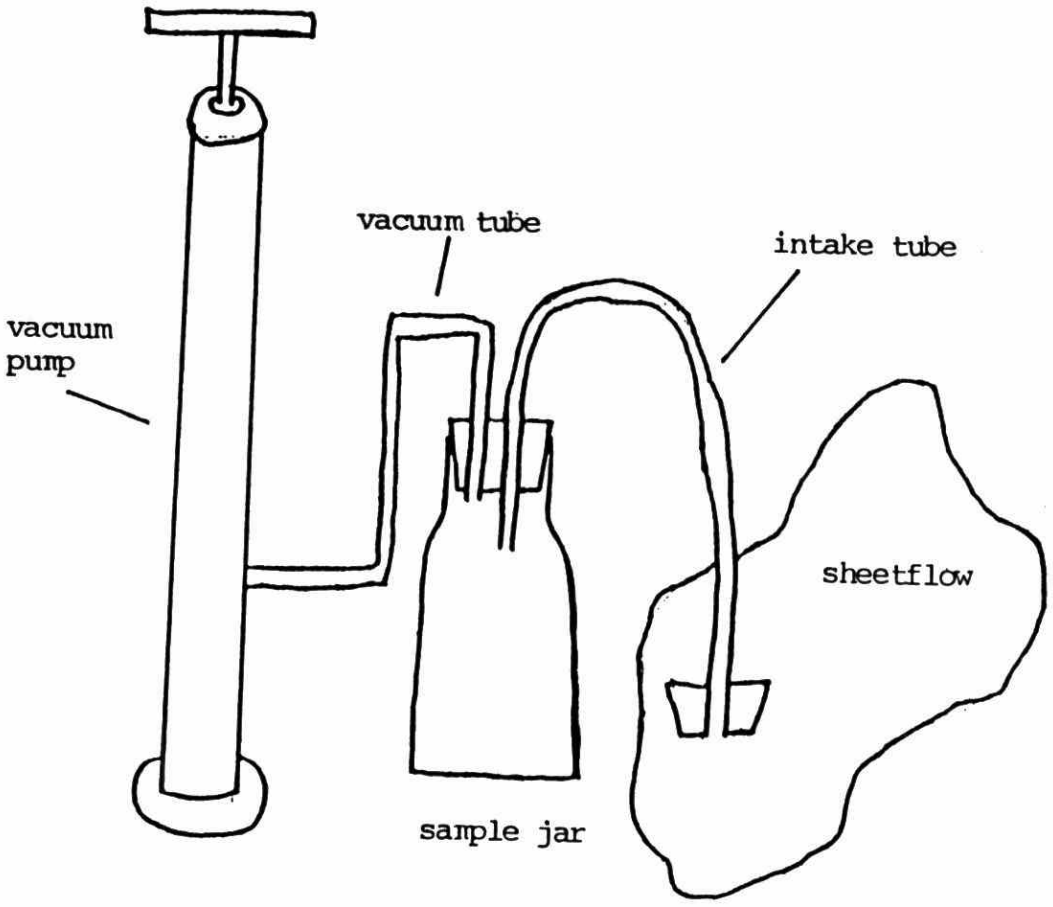
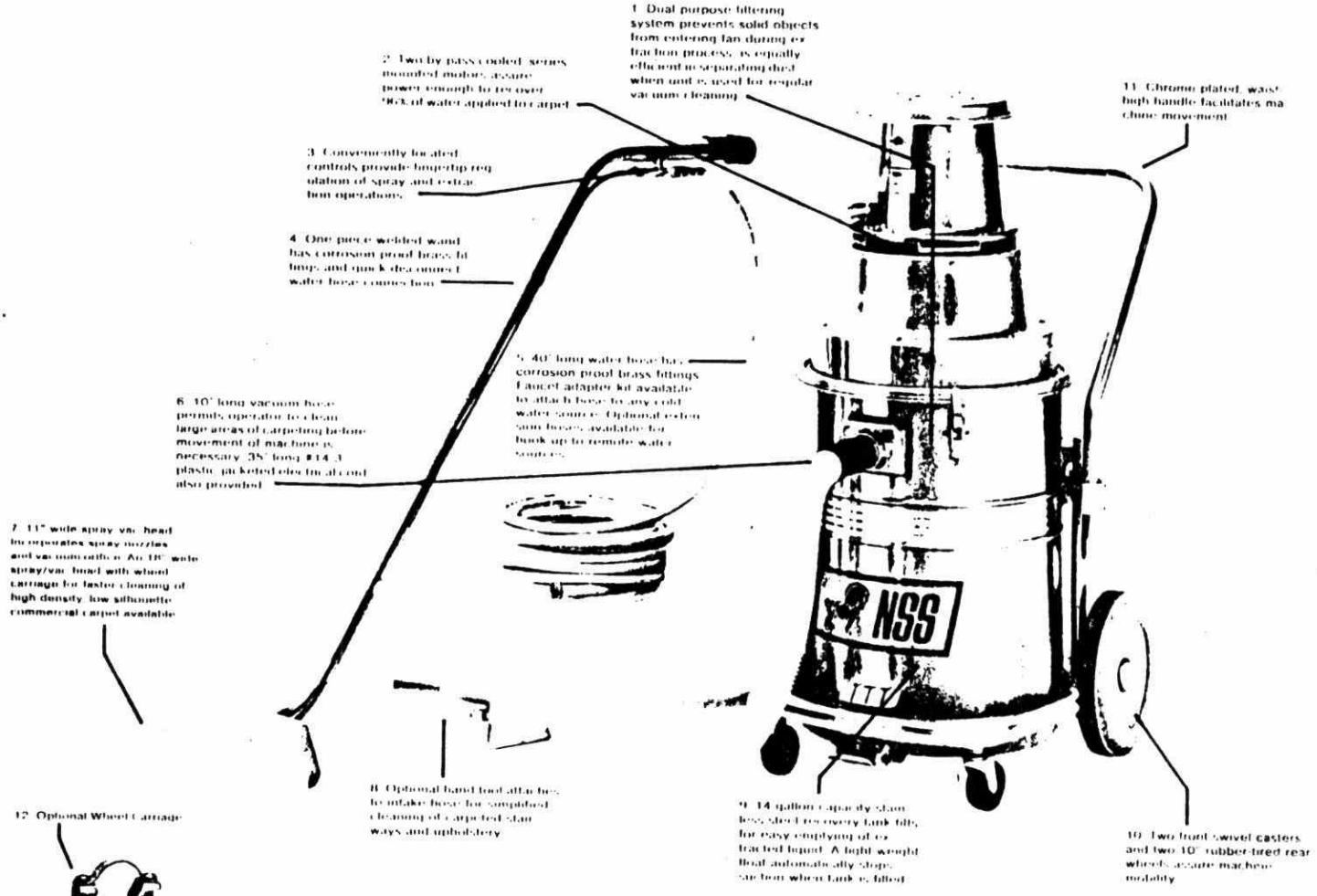


Figure 4

Industrial Vacuum Cleaner



Performance Characteristics

Unlike a standard wet/dry vacuum, an extraction machine squeezes the carpet material by utilizing the weight and the narrow orifice of the nozzle. This results in the use of the small orifices requiring high suction. The following chart shows Stallion's water lift and the C.F.M. at the effective ¾" orifice.

Input Amps. 14.6 / Operating RPM 18,000				
Orifice	Closed	¼"	½"	¾"
Water Lift	140+"	126"	102"	67"
C.F.M.				62.9

Stallion II Specifications

Current:	115 volt/AC-DC 25-60 cycle/14.6 amps.
Cord:	35' 14-3SJT
Motor:	Two 1.25 hp, mounted in series by-pass/ Cooled by separate vent fan
Filter Area:	378 Sq. In.
Height:	Machine only, 41"

Handle Height:	Adjustable 31" to 40"
Overall Width:	19"
Net Weight:	106# Machine Only 70#
Shipping Weight:	122#
Capacity:	19 gallon container recovers 14 gallons.

vacuum cleaner was used, the sediment was emptied into sediment jars using a paint brush and scraper (the person doing this job always wore a dust filter mask). There was no way of sterilizing the collection chamber of the vacuum in between samples. When the vacuum cleaner could not be used just the paint brush and scraper were used. The sediment would be brushed on to the scraper and then placed in the jar.

4.0 DATA PROCESSING AND MANAGEMENT

The data for the CSO and storm sewer catchments were processed and managed differently. For the CSO sites precipitation and flow data was processed and stored on the HP125 system. 14 precipitation events were entered onto the HP125 system (all other events are recorded on daily record sheets). All flow records were entered on the HP125 system. At present the CSO flow data is available on computer diskette for both the HP125 (CP/M) and the IBM-PC (DOS) systems. For the storm sewer sites none of the data was processed on the HP125 system (while being maintained by the Ministry). Precipitation and flow data were transcribed onto daily record sheets. This data was then turned over to Gartner-Lee Limited for the preparation of the stormwater study report.

APPENDIX A

TABLE A1 LIST OF MONITORED EVENTS IN THE HILLARY COMBINED SEWER CATCHMENT

DATE	Event Precip. (mm)	Use of Data: Model Calib.	Use of Data: Model Verif.	Use of Data: Load Rate	Occurrence of Phenomenon: Inflow to Tank	Occurrence of Phenomenon: Overflow From Tank	Occurrence of Phenomenon: Overflow at Site 3	Comments
Apr. 30/83	19.3	Y			Y	Y	Y	
May 1/83	7.9	Y			Y		Y	
May 2/83	14.0	Y			Y	Y	Y	
May 19/83	21.9	Y		Y	Y	Y	Y	
May 22/83	11.6	Y			Y		Y	
May 29/83	11.6		Y	Y	Y		Y	
June 6/83	6.7	Y		Y	Y		Y	
July 4/83	4.3			Y	Y	Y	Y	
Aug. 8/83	24.7			Y	Y	Y	Y	Part of event.
Aug. 22/83	20.2		Y	Y	Y	Y	Y	
Sept. 16/83	29.5			Y	Y	Y	Y	Flow data incomplete.
Sept. 21/83	7.4	Y			Y	Y	Y	
Oct. 12/83	19.0			Y	Y	Y	Y	Precip. gauge problem.
Oct. 13/83	14.2	Y		Y	Y	Y	Y	No SS data.

Note: Y = Yes

(From Wong, Combined Sewer Overflow Study)

APPENDIX B

TABLE B1

STORM SEWER WARM WEATHER MONITORING SEASON (APRIL - DECEMBER 1983)

	EMERY	THISTLEDOWN
# Events monitored (flow, precipitation and water quality)	49	24
Baseflow	← Background samples → April - December	August-December
Sheetflow	← 65 Samples →	
Dry Weather	← Background Samples →	
Washoff Experiments	None	6

TABLE B2

STORM SEWER COLD WEATHER MONITORING SEASON (JANUARY - APRIL 1984)

	EMERY	THISTLEDOWN
# Events monitored (flow, precipitation and water quality)	27	27
Baseflow	← Background samples → ← January - April →	
Sheetflow	25 sites sampled for two events	25 sites sampled for two events
Snow Transect Water Quality	1 site (Signet Road)	1 site (Calstock Bvld.)

APPENDIX C

LIST OF PARAMETERS ANALYZED

Parameter	Storm Sewer Sites	CSO
Total Residue	Yes	No
Filtrate Residue	Yes	No
Particulate Residue	Yes	Yes
Phosphorus	Yes	Yes
Phosphorates	Yes	Yes
Total Kjeldahl Nitrogen	Yes	No
Ammonia Nitrogen	Yes	No
Phenolics	Yes	No
Chemical Oxygen Demand	Yes	No
Fecal Coliform	Yes	Yes
Fecal Streptococci	Yes	No
Pseudomonas Aeruginosa	Yes	No
Aluminum	Yes	No
Arsenic	Yes	No
Cadmium	Yes	Yes
Chromium	Yes	No
Cobalt	Yes	No
Copper	Yes	Yes
Lead	Yes	Yes
Molybdemum	Yes	No
Nickel	Yes	No
Selenium	Yes	No
Zinc	Yes	Yes
Calcium	Yes	No
Magnesium	Yes	No
Sodium	Yes	No
Potassium	Yes	No
Total Alkalinity	Yes	No
pH	Yes	No
Chloride	Yes	No
Sulphate	Yes	No
PCB's	Yes	No
BOD5	No	Yes